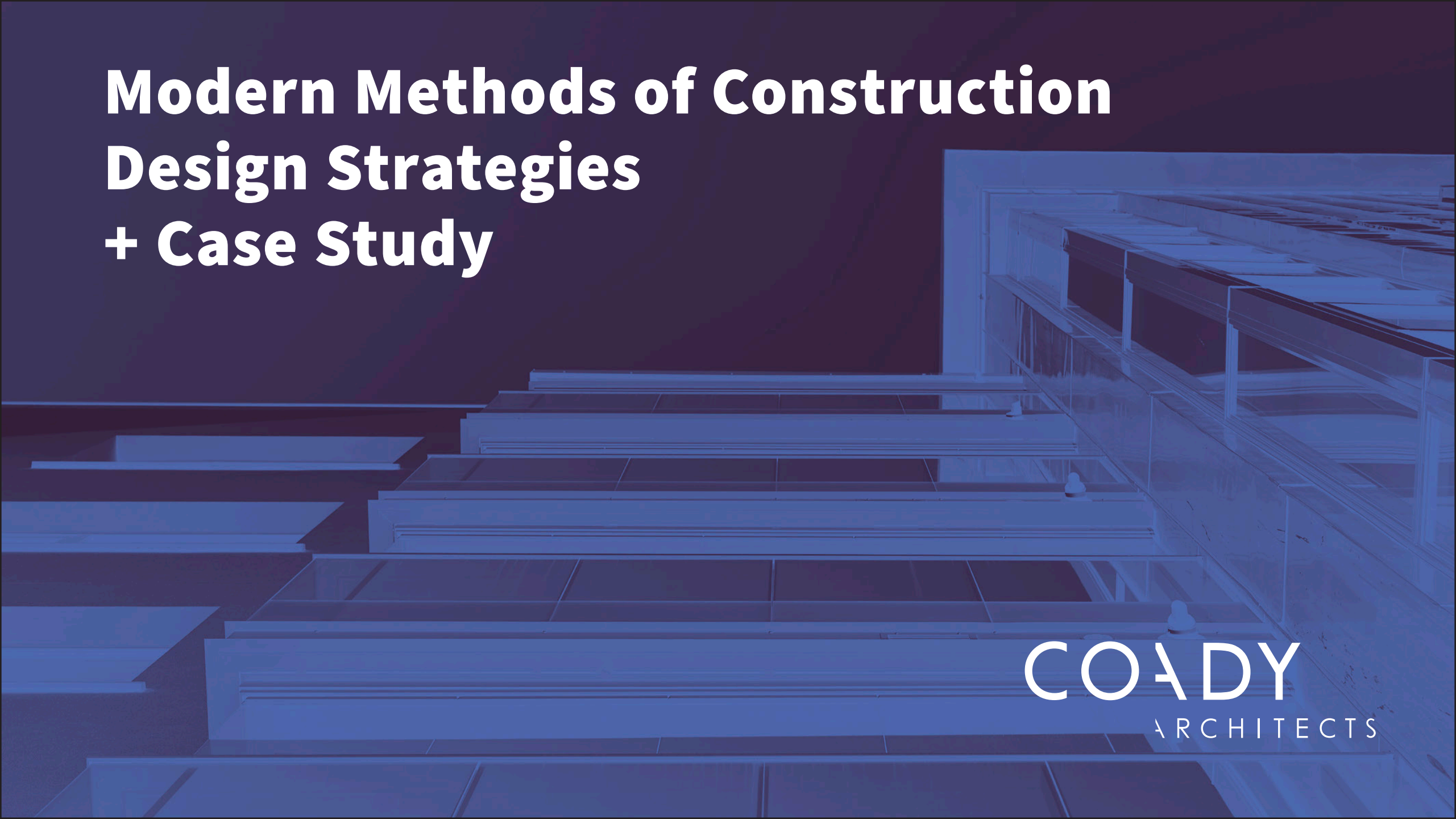
# Modern Methods of Construction Design Strategies + Case Study



CODY
ARCHITECTS

# Agenda

# Introduction

## Overview of Design for Manufacture and Assembly (DfMA) and Modern Methods of Construction (MMC)

→ Benefits

→ Challenges

→ Design Considerations

→ Site Considerations

## MMC Case Study Tallaght

→ Overview

→ Compliance

→ Outcomes

## Other Experience

→ Healthcare / Residential

→ Housing

→ Commercial Offices

# Who we are

3 Directors

4 Associate Directors

12 Associates

70+ Staff

## **Design excellence, quality service** and **advanced low energy buildings**

Residential + Student Accommodation
Commercial Fitout + Interiors
Science + Technology + Industry
Education + Research
Health, Conservation, Culture

COADY ARCHITECTS

BUILDING COMMUNITIES

# Living


COADY ARCHITECTS

BUILDING COMMUNITIES

# Working

BUILDING COMMUNITIES

# Wellbeing




CODY ARCHITECTS

BUILDING COMMUNITIES

# Learning


COADY ARCHITECTS

# Partner Architects

## Europe

PERSPECTIVE


**Antwerp, Dublin, Helsinki, Lisbon, Madrid,**
**Milan, Paris, Poznan, Stockholm**
Cape Verde, Croatia, Czech Republic, East Timor, Hong Kong,
Philippines, Singapore, Switzerland
São Paulo, Rio de Janeiro, Recife, India, Maputo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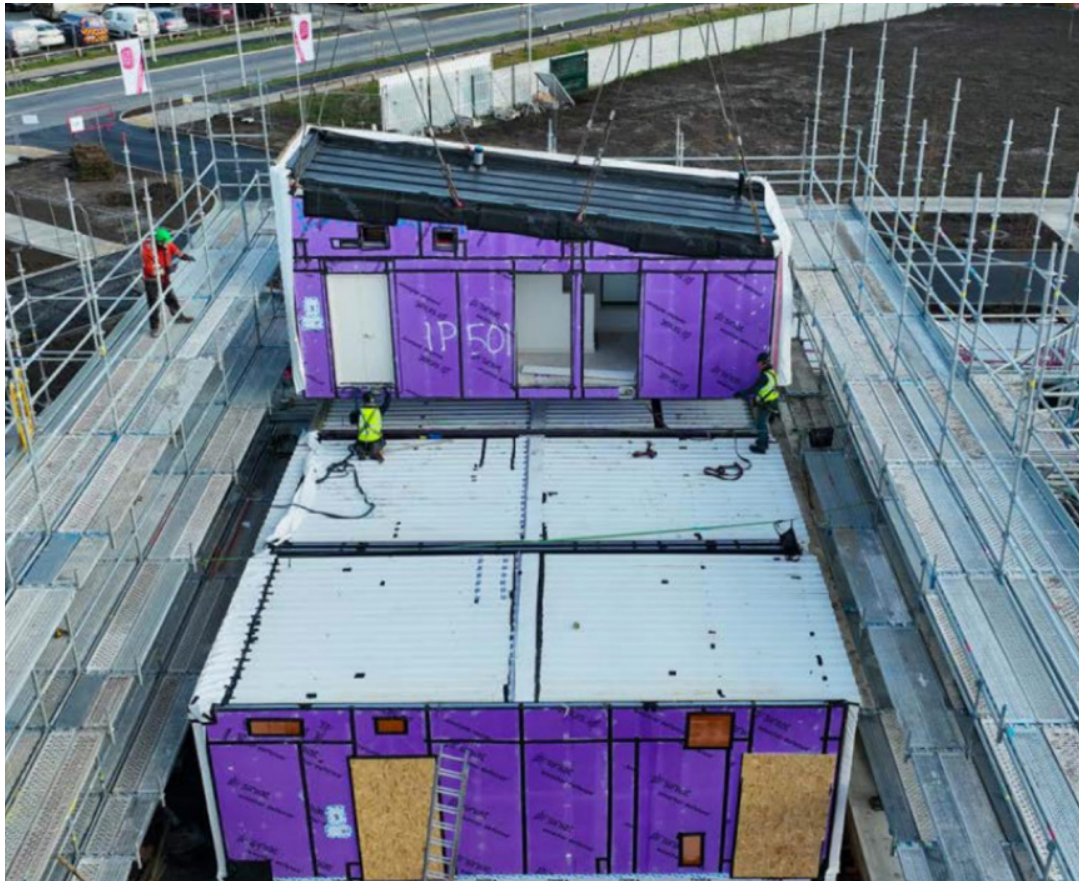
# Design for Manufacture and Assembly (DfMA) and Modern Methods of Construction (MMC)

- **Category 1 – 3D Primary Structural Systems:** Volumetric 3D structural systems
- **Category 2 - 2D Structural Panelised:** Panelised systems in timber, light gauge steel (LGS), CLT and precast concrete panels
- **Category 3 - Non-Systemised Primary Structure:** Prefabricated components such as trusses, open-web joists, precast floors
- **Category 4 – Additive Manufacturing:** 3D-printed building components manufactured either onsite or offsite
- **Category 5 – Non-Structural Assemblies and Sub-Assemblies:** unitised facades, bathroom pods, balconies, plant assemblies
- **Category 6 – Traditional Products with Site Productivity Improvements:** prefab/ brick cladding, large format roof cladding
- **Category 7 – Site Process Labour Reduction / Productivity improvements:** laser scanning, drones, autonomous machinery

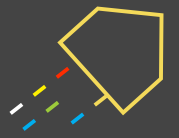
*(UK Government's Ministry of Housing, Communities and Local Government's Joint Industry Working Group on MMC.)*



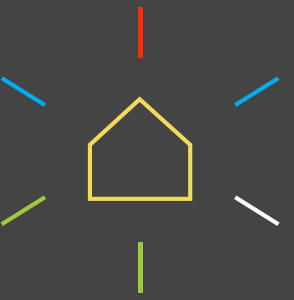
# Why MMC?

**Improved Quality + Lower Defects**

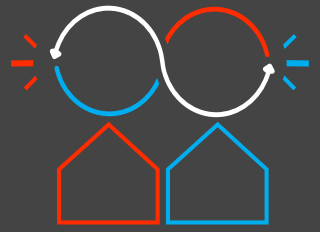
**Improved Health + Safety**



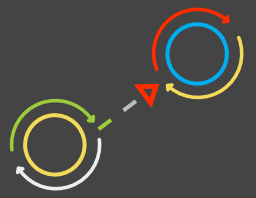
**Speed**



**Sustainability, Less Waste, Lower Water Consumption**



**Diversity + Inclusion**



**Less Disruption**

**Better Predictability**

**Skilled Workforce**

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# Programmatic Benefits of MMC


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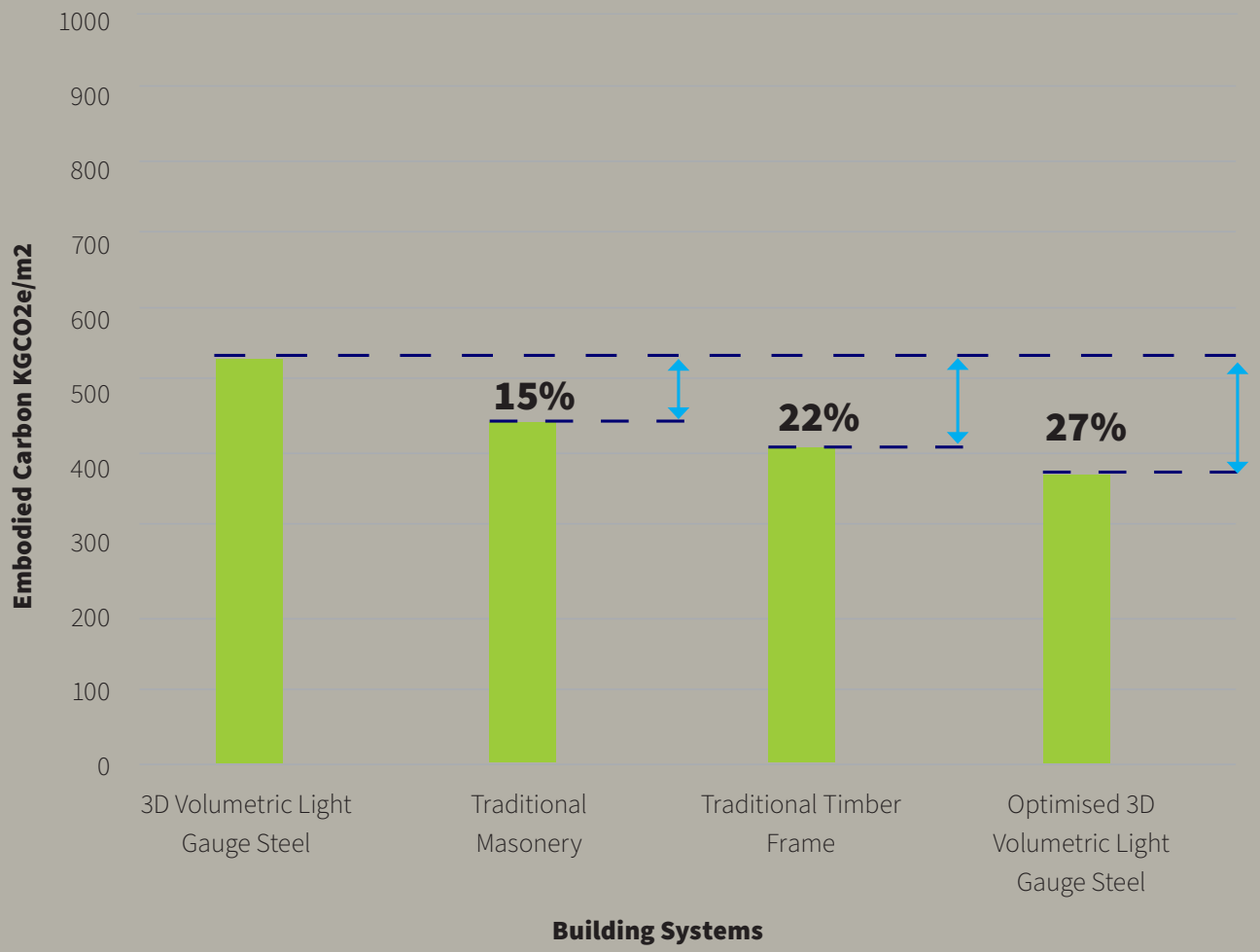
# Sustainability

- → Increased quality control
- → Reduced waste
- → Reduction in transportation carbon footprint

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# Challenges

- → **Cost**
  - 2D panellised: LGS cost competitive with timber frame
  - 3D modular: cost needs to be offset by scale, reduced programme and prelims.
- → **Design** - Requires repetition, minimise ‘types’ on the factory floor.
- → **Certification** - Fire Safety and system limitations
- → **Site** - Storage capacity and temporary weathering
- → **Quality** - Jointing of modules

PROJECT

# Apartments: Innovation Square, Tallaght, Dublin

**133 bedspaces**

CLIENT

**South Dublin County Council/ JJ Rhatigan**

STATUS

**Completed December 2024**

## 133 affordable rental apartments and community facilities

Appointed by South Dublin County Council (SDCC) for design, Planning, Fire Safety, Disability Access Certification and Tender Documentation

Novated to JJ Rhatigan for site delivery and handover.

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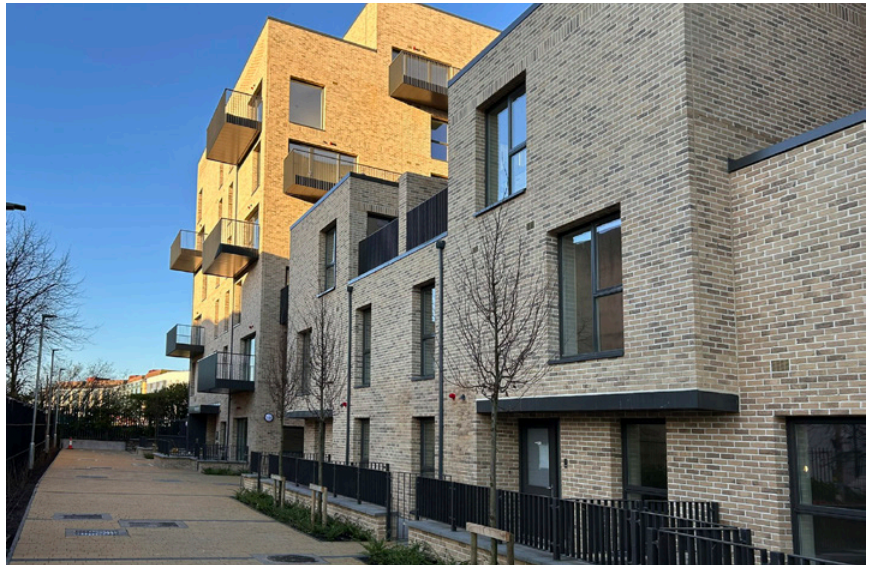
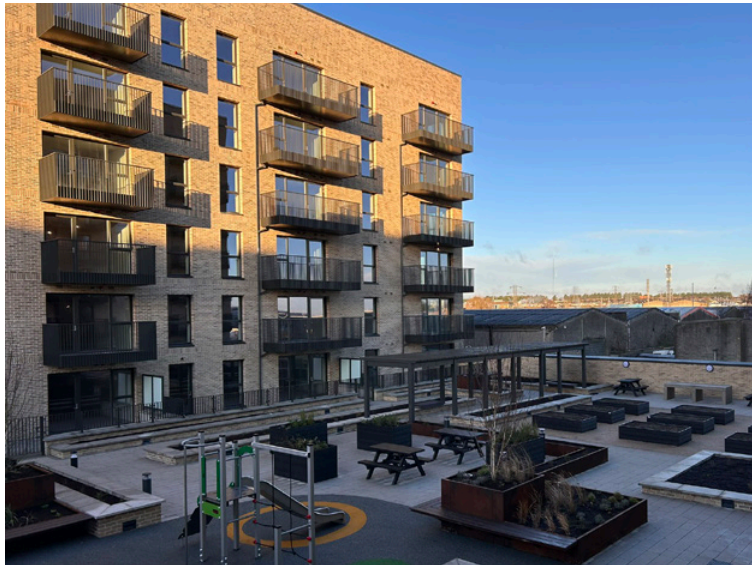




# Site Context

## Urban Regeneration Brownfield site

### Expanding residential development into industrial context

The Development Site

SDCC Masterplan Area

Cookstown Industrial Estate

Exchange Hall

Tallaght Hospital Campus

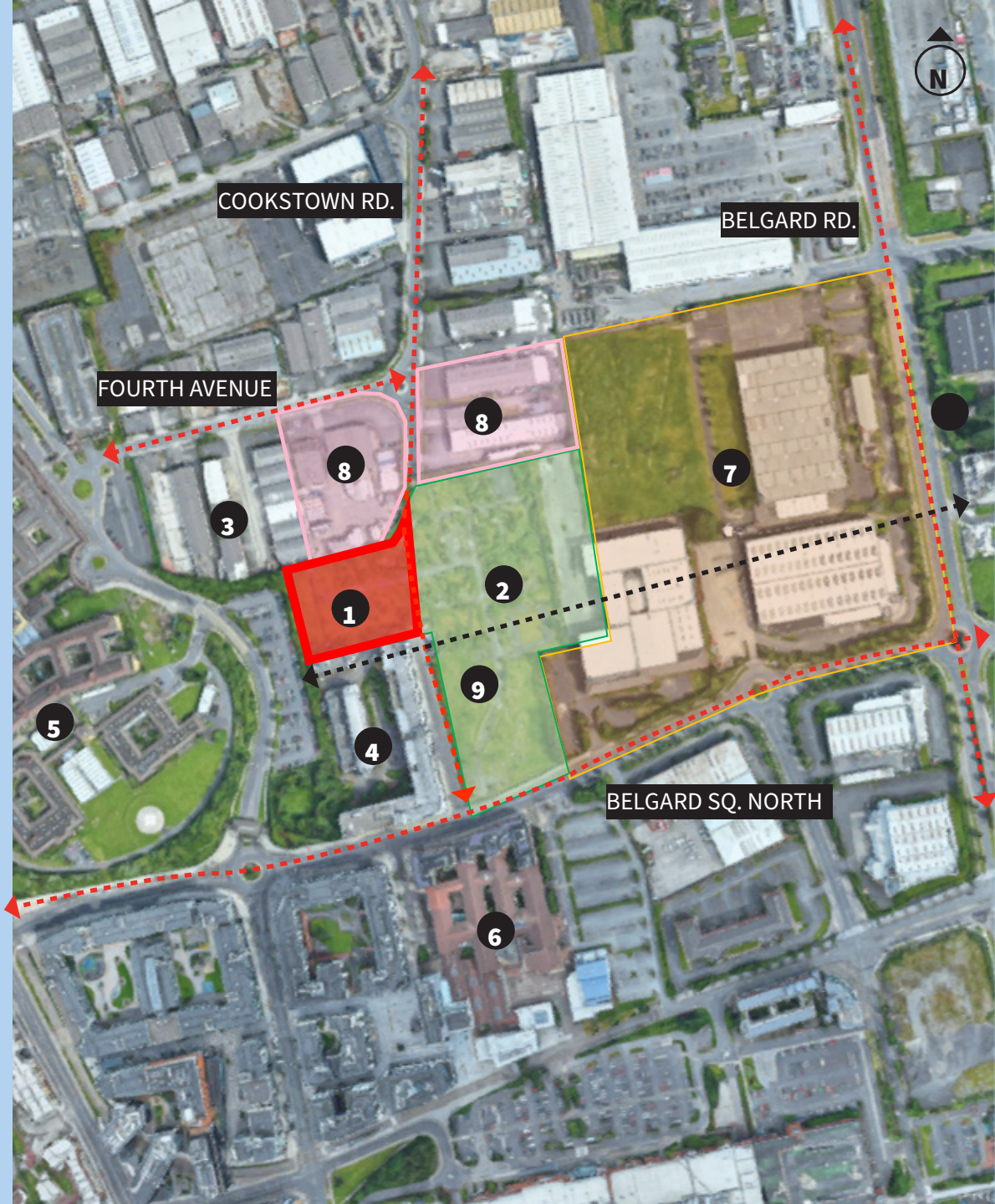
SDCC County Hall

Mixed-Use Development

Future Residential Development

New Link Road

Greenway

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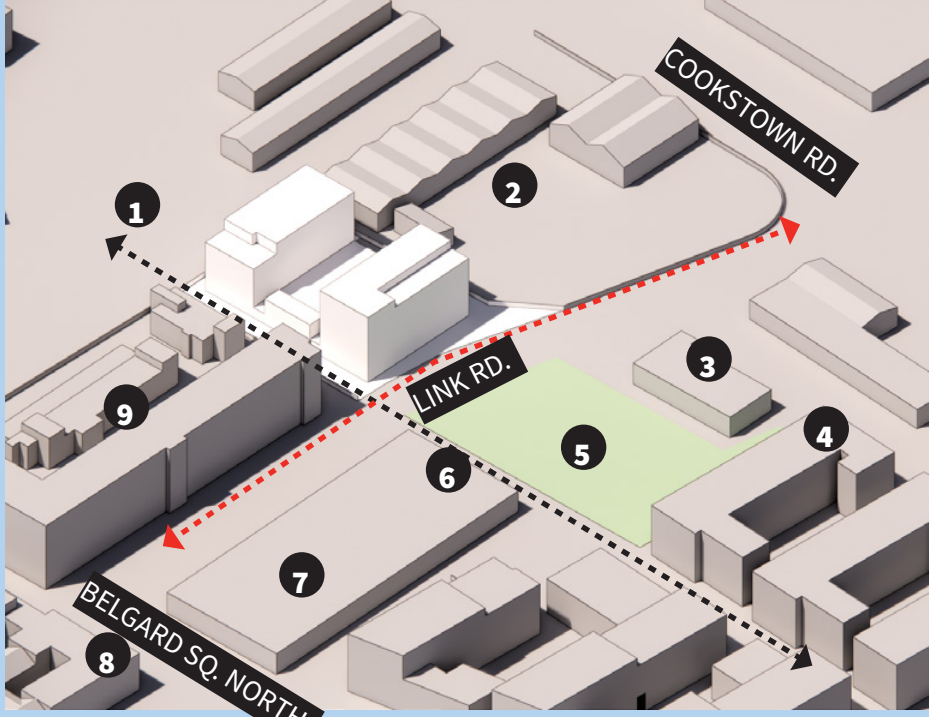
# Site Context

## Masterplan

South Dublin County Council Masterplan includes:

- → **apartment scheme**
- → **public park**
- → **innovation hub**
- → **school**
- → **continuation of the ‘greenway’**
- → **‘link road’** between Cookstown Road and Belgard Square North

The apartment site is located at the confluence of the park, greenway and link road



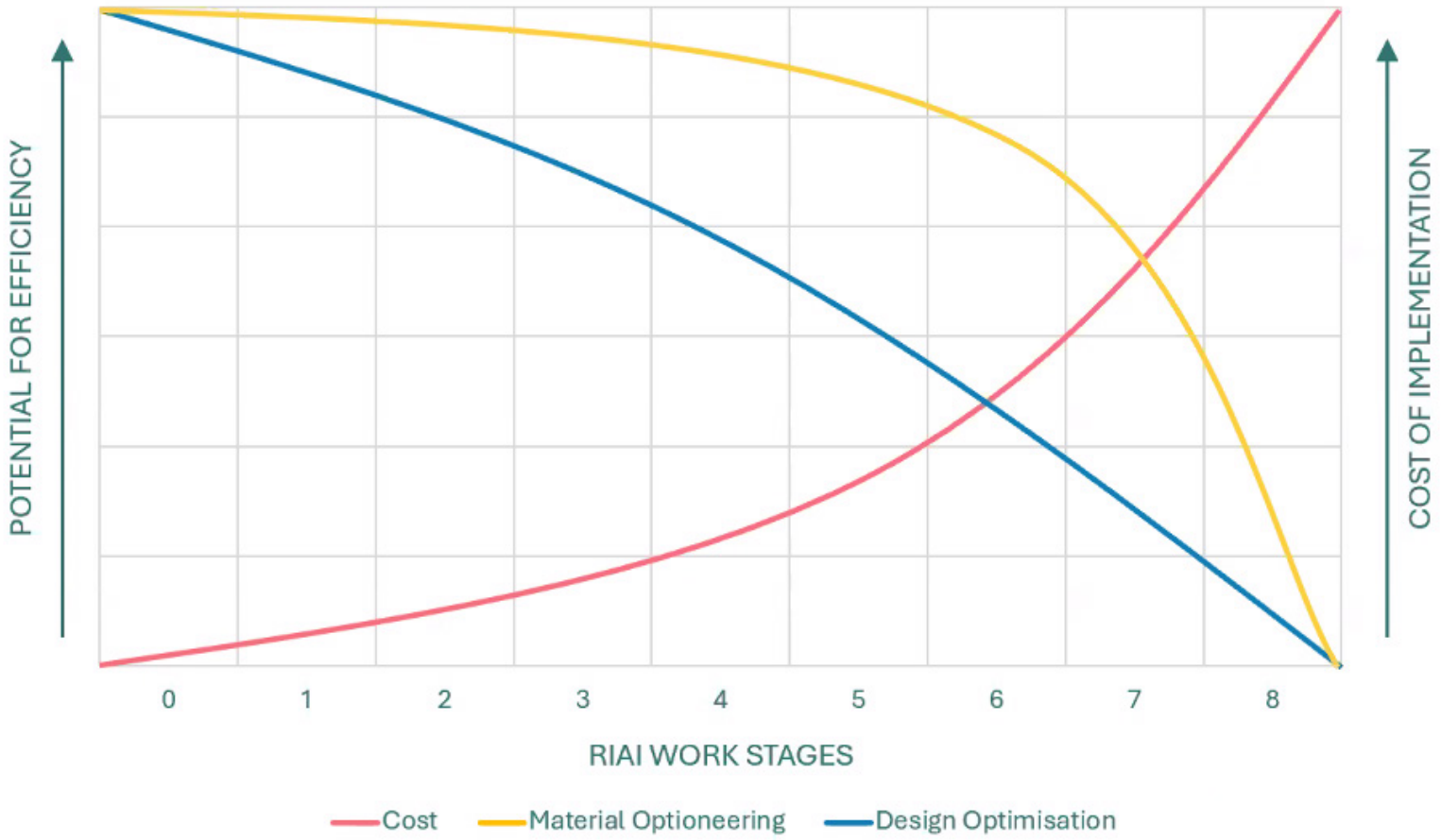

1 Tallaght Hospital Carpark
2 Cookstown Industrial Estate
3 Innovation Hub
4 Marlet Site
5 Public Park
6 Greenway
7 School Site
8 SDCC County Hall
9 Exchange Hall

# Design Considerations

**“Move Left”** Principle:
✓ **Early** engagement
✓ **Early** coordination
✓ **Early** procurement

Incorporating MMC into a design is most effective in the early stages

Good design should have flexibility to facilitate both MMC and traditional construction.



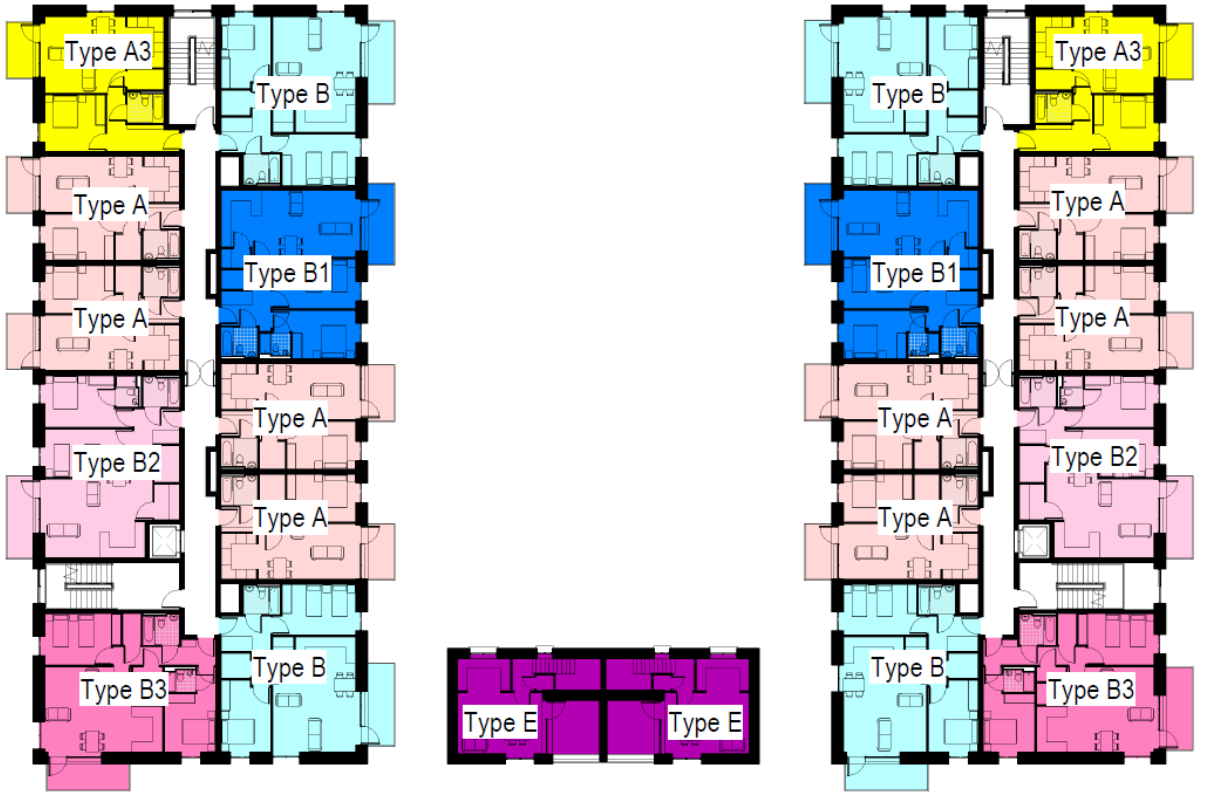

Extract Sisk Presentation on MMC 2024

# Design Considerations

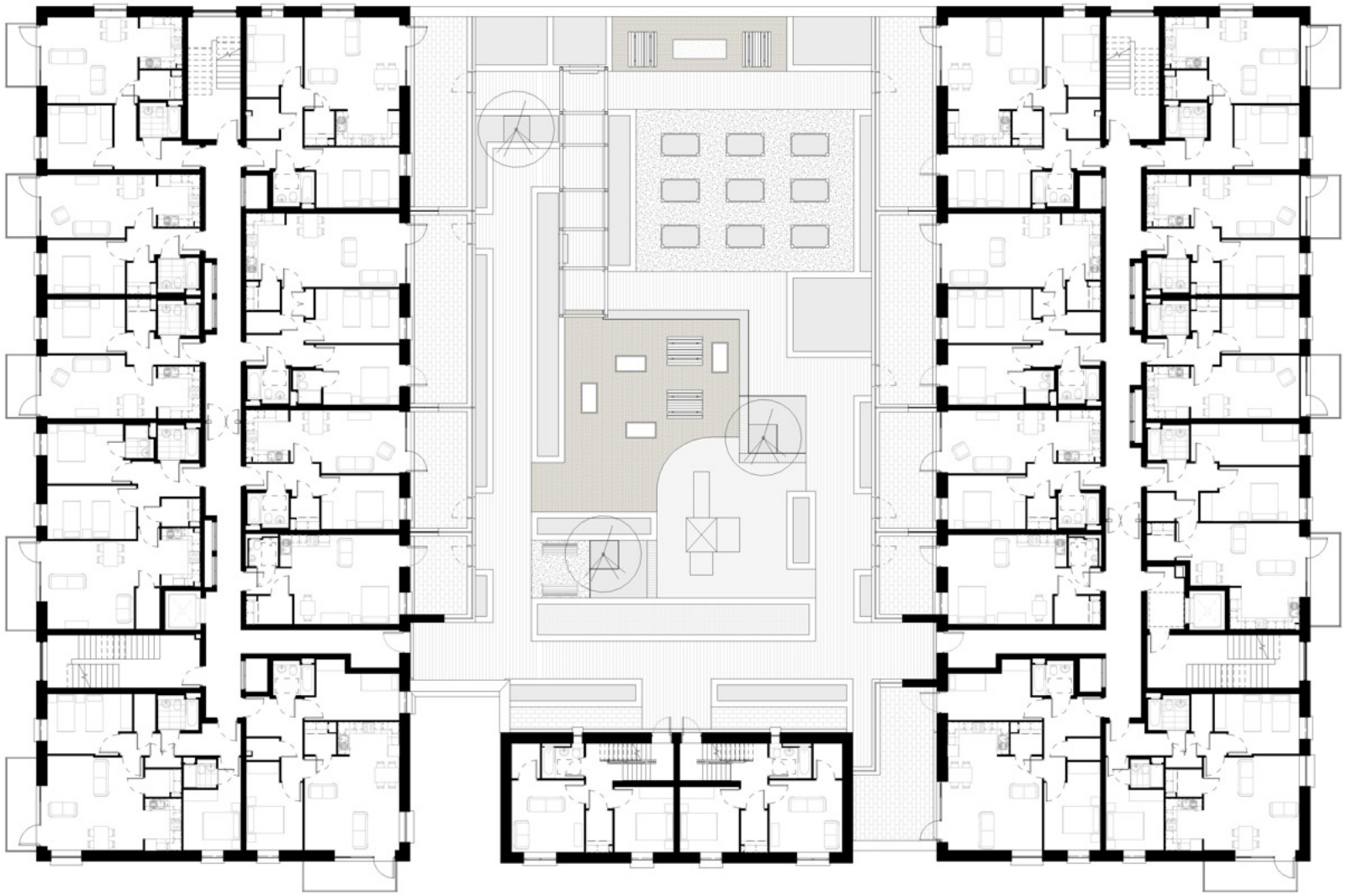
**Building Design & Layouts**

Consider MMC at outset of design process

- → **Repetition** –Reduce ‘types’ for the factory floor
- → **Space Planning** - Contain a full room within a module – no temporary weathering of large opes
- → **Junctions** - Consider direction of module spans – how are components linked
- → **Cores** - Concrete cores with precast stairs cost effective with simpler fire safety detailing
- → **Heights** – Allow for build-up of combined ‘base’ and ‘roof’ cassettes in category 1 3D modules
- → **Module Sizes** – maximise loading of delivery vehicles to minimise transport cost



# Case Study- Apartments:
# Innovation Square, Tallaght



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# Case Study- Apartments: Innovation Square, Tallaght

The key aspects of the design are:

- → A **simple form** of 2 parallel blocks, 6/7/8 storeys
- → A central 3 storey duplex block to the 'greenway'
- → **10 units per floor** per block with 2 stair cores
- → Predominately 1 & 2 bed **non-sprinklered** units
- → All primary living spaces are south/east/west facing with over **40% dual aspect**
- → Site constraints led to podium for communal open space with parking, plant, & landlord areas below
- → Connected to the **Tallaght District Heating Network**
- → Excess heat from local data centre provides **low carbon space heating and hot water**

COADY ARCHITECTS

# Design Considerations

**System Build-up**

- → **Fire Safety** – limitations of system e.g. Extent of services in external walls
- → **Structure** – Light gauge steel, hot rolled steel, concrete floor for fire separation
- → **Cladding** - factory or site fitted?, traditional cladding or part of MMC system?
- → **Joints** – how are components joined for weathering, fire safety, durability and appearance?
- → **Maximise off-site fabrication** – install windows and cills, early co-ordination of multiple subcontractors
- → **Building Services** – factory fitted?, crossover between modules and 'letterbox' firestopping
- → **Airtightness** - where is the envelope line? What needs to completed on site?
- → **Interfaces** - MMC with traditional construction, different layout at ground level, podium or carparking?

# Move to MMC

**The building design facilitated extensive use of MMC.**

→ Simple rectangular building form

→ Regular stacked structural layout & no transfer structure

→ Steps in building form align with primary structure limited repetitive layouts

→ Minimise beams & no transfer structure

**Category 2, 3 & 5:**

→ A full precast floor/roof structure and envelope was employed including wall insulation, and brick cladding.

→ Prefabricated Balconies - 2 types

→ Bathroom Pods – 2 layouts across 133 units

→ Standardised windows and cills fitted into the MMC panels prior to delivery on site.


**Pre-finished architectural wall panel**

**1.** *Brick slips*
**2.** *80mm external precast outer leaf*
**3.** *200mm high perfoming insulation*
**4.** *200mm internal PC wall*

*Bathroom Pods being manufactured for the scheme*

# Site and Construction Considerations


- → **Access** – wide load and long bed transport
- → **Storage** – timing and quantity of deliveries, is the site ready?
- → **Temporary weathering** – avoid moisture ingress to external fabric and internal finishes
- → **Installation** – weight of components, type, capacity and reach of crane

# Building Regulation Compliance

**Assigned Certifier had a key role in the early compliance check**

Key areas of Building Regulation Compliance related to the MMC elements: A, B, D, F, and L

→ Agrement certification is still in progress

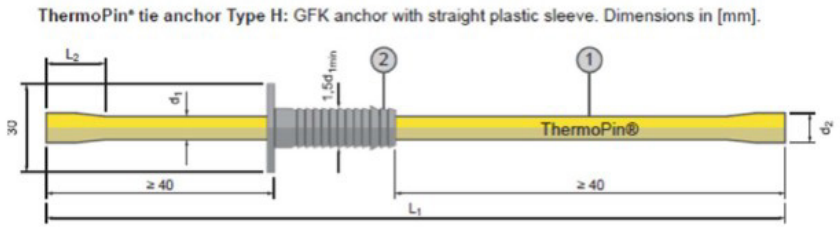
→ O'Reilly Precast – Designers of the panels

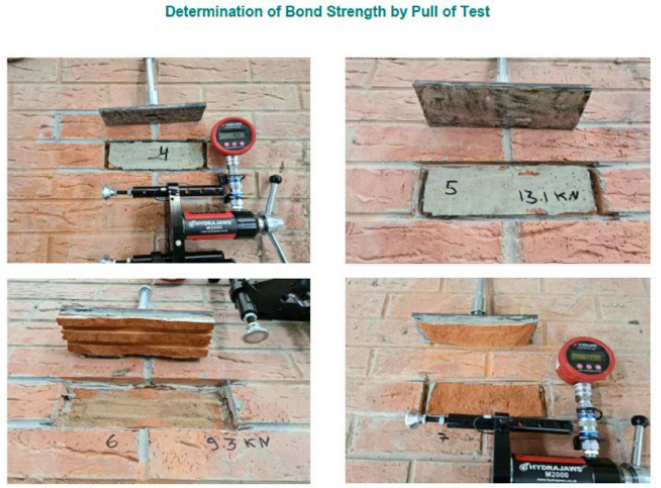
→ Standard Technical Submittal Procedure for all elements

**All components within the wall panel were CE marked and had a DOP**

→ Rigorous and Early Technical submittal process maintained

→ Factory inspections were undertaken throughout the manufacturing process

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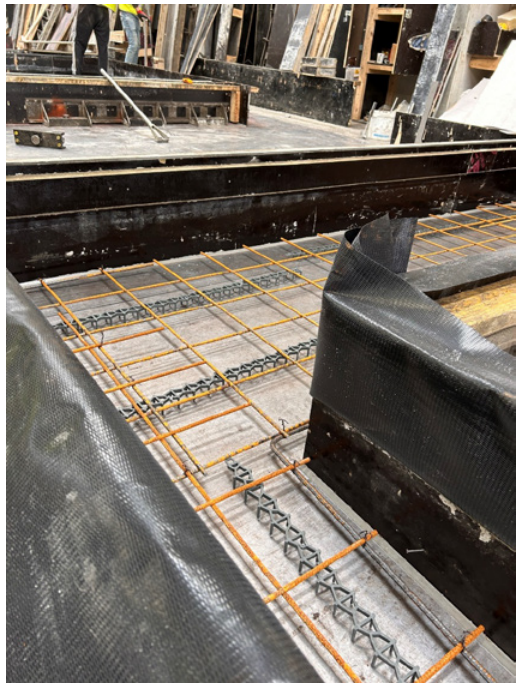


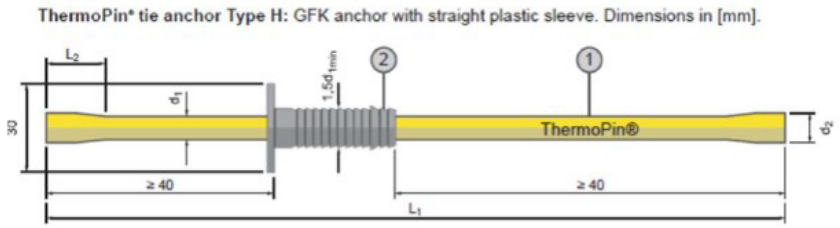
COADY ARCHITECTS

# Compliance: Part A - Structure

**Full Structural calculations were provided**

**Collaborative working between the Contractor, Design team and Sub-contractors**

- → Pull out tests
- → Loading calculations
- → Panel junctions and joints
- → Factory inspections were undertaken throughout the manufacturing process
- → Structural Design by ORC
- → ORC designed supporting structure to cater for applied loads from balconies





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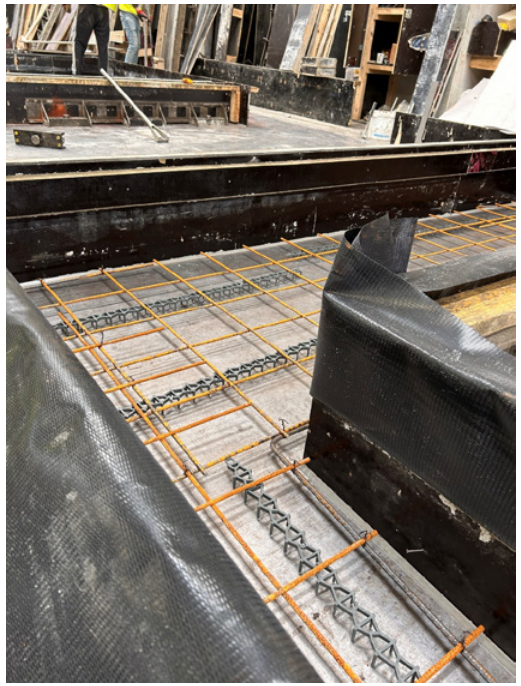


# Compliance: Part B

**Non-Combustible materials used (A1 Combustability)**

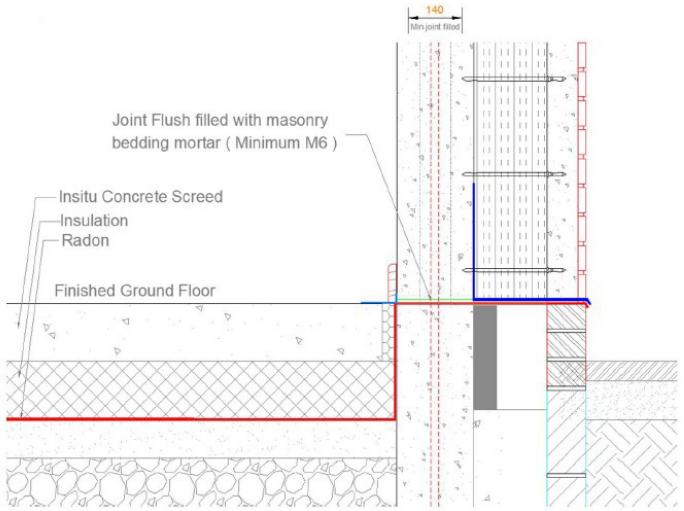
→ Fire rating of each component was also provided for review

No cavity within the wall build up

No changes were required to the FSC as a result of MMC

Fire Consultant review and engagement was required at technical submittal stage

Fire test results provided




# Compliance: Part D

Regular factory inspections undertaken

**Quality Control and Workmanship**

- → Brick details, solider coursing & window reveal depth incorporated into precast panels – **no loss of design intent**
- → Inspections were **undertaken in the factory**
- → **Sample panel** including mortar and detailing factory approved
- → **No limitations** to brick or mortar selection
- → **Windows and cills** were installed prior to delivery to site
- → **Steel stubs** for balconies installed off site
- → **Sample panels** delivered to site for benchmark review
- → **High quality and consistency of finishes achieved**
- → **Double quality check** at factory and on site

# Compliance: Part D

**No scaffolding was required on the façade**

→ Mobile crane used for any finishing requirements

Precast stair access provided throughout

Increased safety in a factory setting compared to typical site

Reduction in Noise and Dust emission

Minimised on-site waste production

Rigorous off site quality inspections augmented by on-site checks

# Compliance: Part F and Part L

### Thermal Modelling

→ Undertaken at all junctions

→ Accurate Thermal Bridging Factor provided

→ Areas of higher conductivity could be identified and mitigated if needed

### Air Tightness

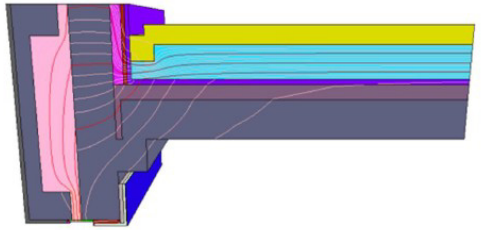
→ Average results c.1m3 /(h.m2 )

→ Factory installed windows = improved air tightness

### U-Values

→ Low uvalues achieved throughout building fabric

→ Reduction in issues associated with onsite traditional construction methods



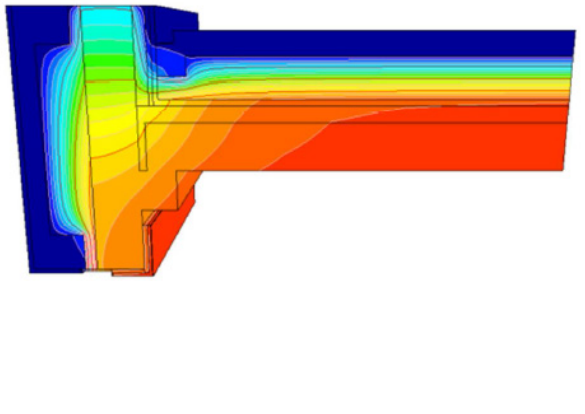
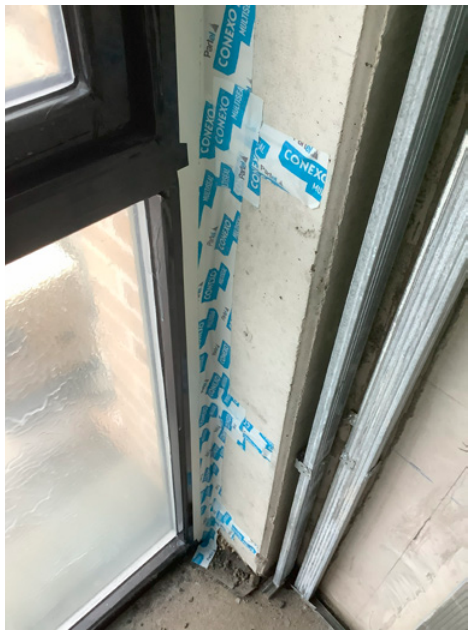
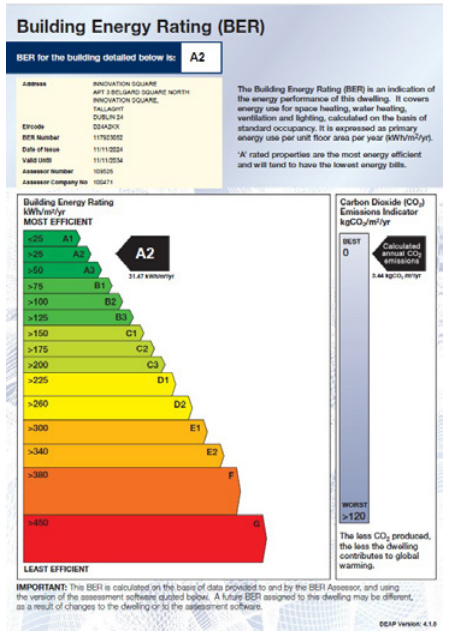



**Figure 9 Isotherms (colour increment of 1°C, line increment of 5°C).**



# Sustainability

High amount of cement is used in the precast process

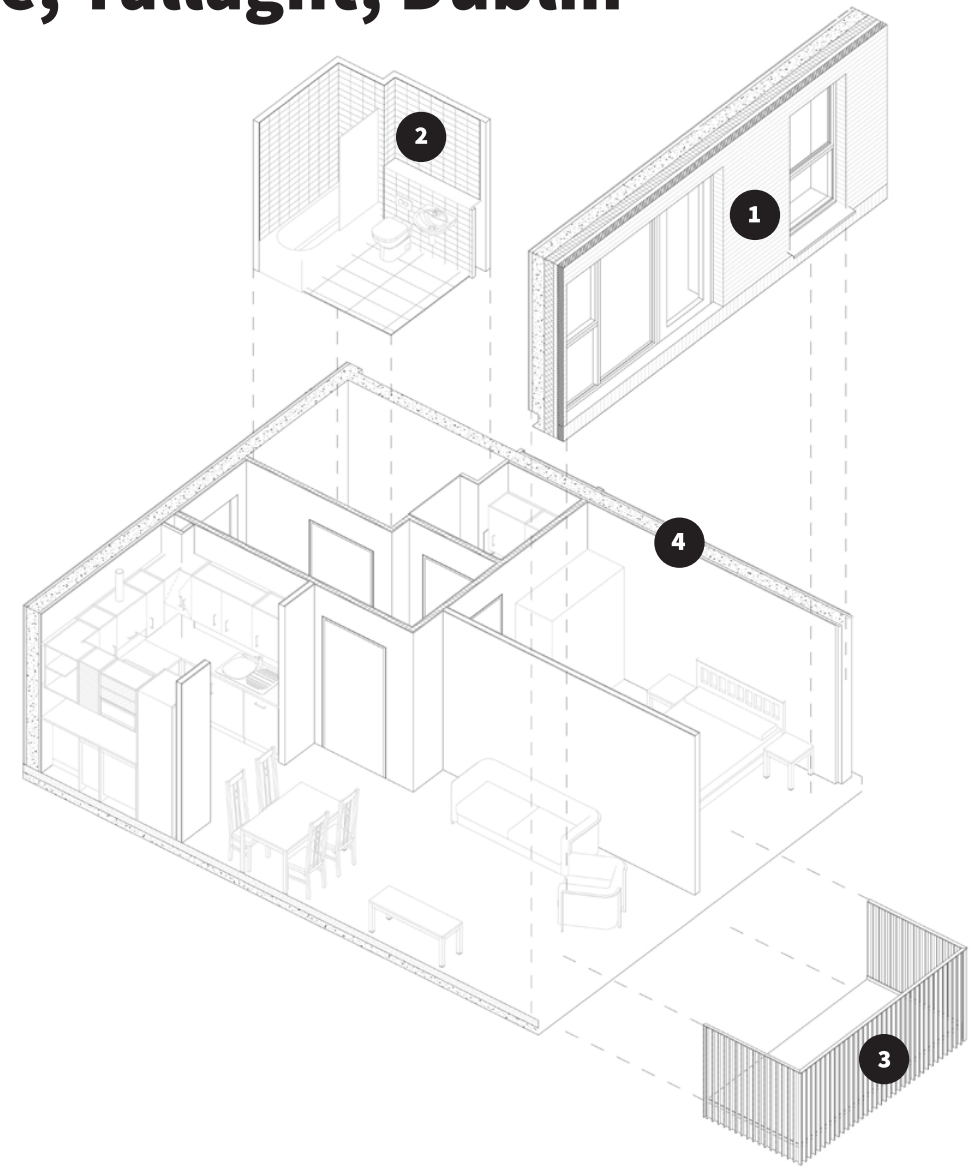
GGBS could be used as an alternative

COADY have been engaging with suppliers on sustainable precast methods however this results in a slower production time

# Outcomes and Design Learnings: Innovation Square, Tallaght, Dublin

## Outcomes

- → Omission of scaffolding and traditional bricklaying
- → A high-quality consistent finish from factory and site inspected prefabricated components.
- → A 3-month construction programme saving
- → Early engagement required between the Assigned Certifier and Design Team
- → Collaborative working from the outset is key to successful delivery
- → Repetition is a positive but not inhibitive




**1.** *Pre-finished architectural wall panels*
**2.** *Bathroom Pods-manufactured offsite*
**3.** *Pre-Fabricated balconies*
**4.** *Precast structural internal walls*


O'REILLY
precast
O'REILLY
precast
JJ Rhatigan
JJ Rhatigan


COMBISAFE
COMBISAFE

COADY ARCHITECTS

PROJECT

# Healthcare/ Residential: Ronald McDonald House, Dublin

CLIENT

**Clancy Construction**
**RMHC Ireland Ltd./ National Paediatric Hospital Development Board**

STATUS

**On Site – Completion August 2025**

## Category 2 & 3:

- → Concrete basement carpark
- → Steel frame ground floor structure
- → Insulated 2D LGS loadbearing panels to all upper floors
- → ‘Comflor’ concrete on metal deck floors & roof
- → Traditional brick cladding
- → Pods not utilised due to procurement times

COADY ARCHITECTS

PROJECT

# Housing: Camross, Sligo

**39 dwellings**

CLIENT

**Visionbuilt**

STATUS

**On Site December 2024**

## 39 Dwellings ( 24 duplexes and 15 Houses)

Delivered under a Design and Build Contract

- → Category 2&3: 2D Panelised LSG walls and prefabricated roof trusses
- → Traditional masonry external leaf and concrete roof tiles.

COADY ARCHITECTS

PROJECT

# Student Accommodation: Queen Street, Galway

**345 bedspaces**

CLIENT

**Elkstone**

STATUS

**Completion March 2025**

**345 beds (44 cluster apartments)**

BREEAM ‘Excellent’

Category 2, 3 & 5:

→ Precast floor/roof structure and external envelope

→ Bathroom Pods

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# Case Study-Student Accommodation: Queen Street, Galway



COADY ARCHITECTS

PROJECT

# Residential

STATUS

**Planning Permission granted on 14 sites.**
**Bundle 4 tender Q2 2025**

**2,133 Apartments, Duplexes and Houses**
**over 17 sites** in Dublin, Kildare, Wicklow & Louth

COADY ARCHITECTS

# Residential

Circa **2,500 houses, duplexes & apartments**

**Social & Affordable homes**

Key brief criteria:

→ High quality sustainable residential design - spatial, accessible, daylig and aspect

→ Efficient cost-effective solutions for delivery at scale

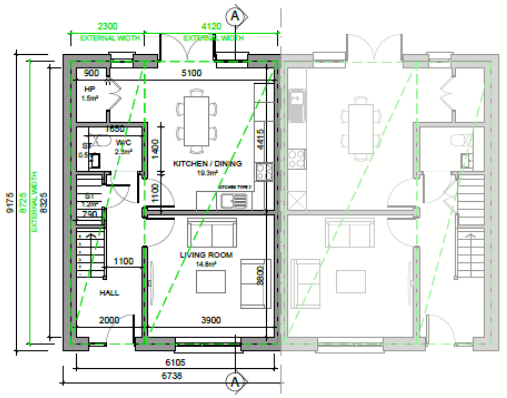
→ Repetition of Typologies

→ Facilitate Modern Methods of Construction

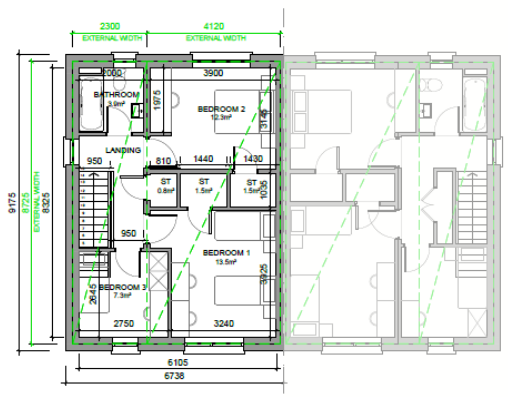
**Currently at Pre-Part 8 application stage**


FRONT ELEVATION


REAR ELEVATION




GROUND FLOOR PLAN
Area 50.8 m2
O/ALL AREA 101.6 m2




FIRST FLOOR PLAN
Area 50.8 m2
O/ALL AREA 101.6 m2

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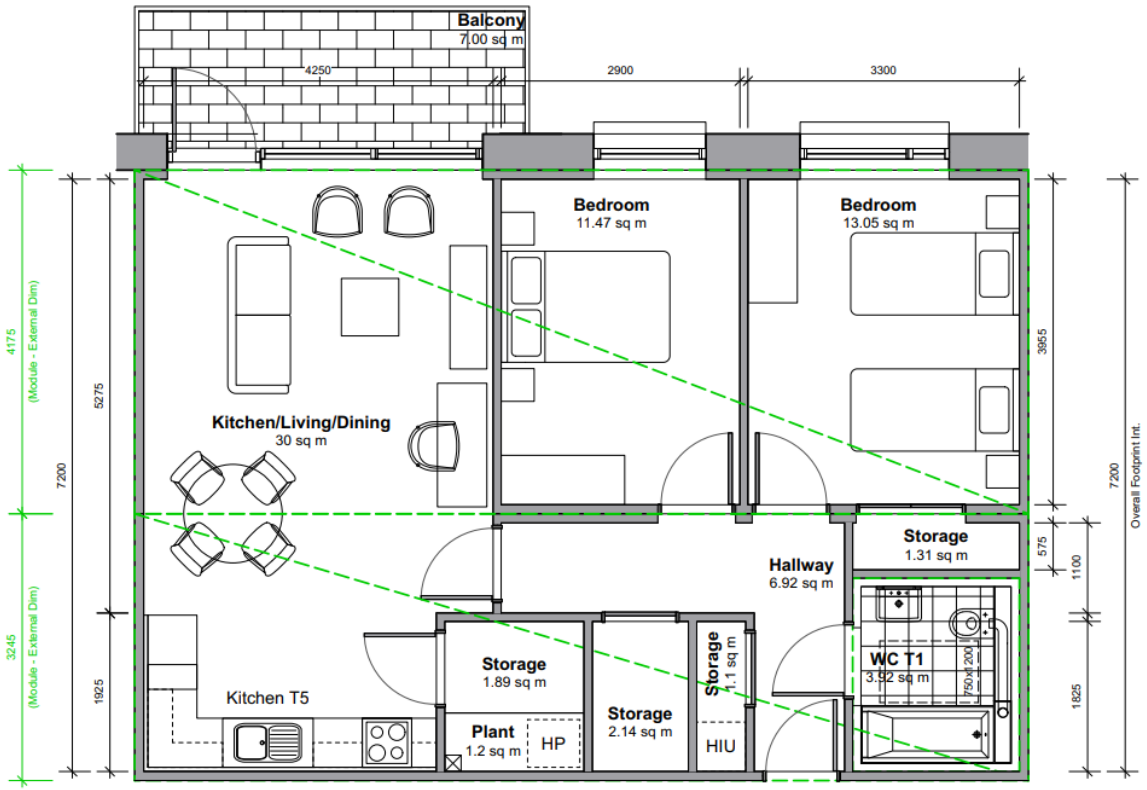
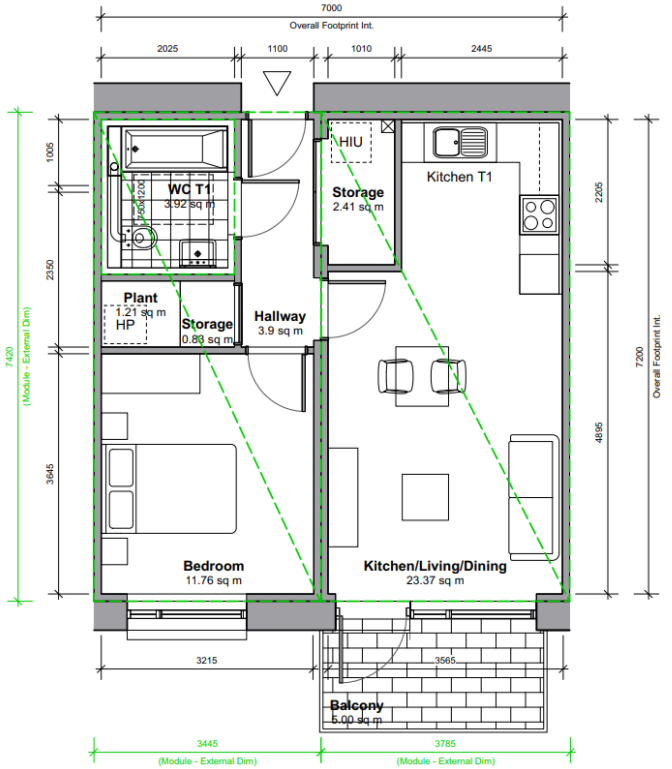
# Residential

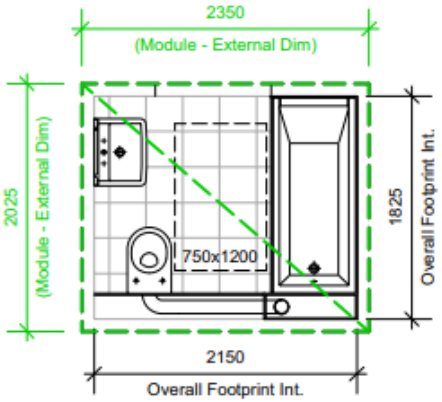


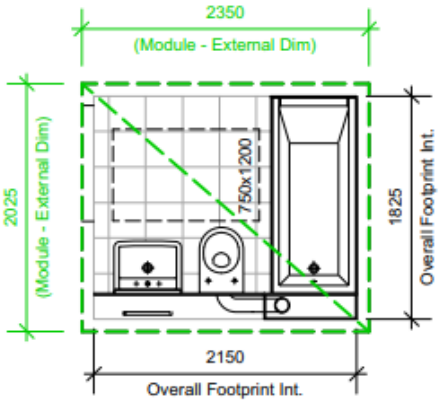

- → Exemplar typologies developed for utilisation across multiple sites
- → **Suitable for both MMC/ Modular and traditional construction**
- → Reduced number of variants for efficiency of delivery.
- → **Direct industry engagement & typology review** prior to lodgement of Planning applications

COADY ARCHITECTS

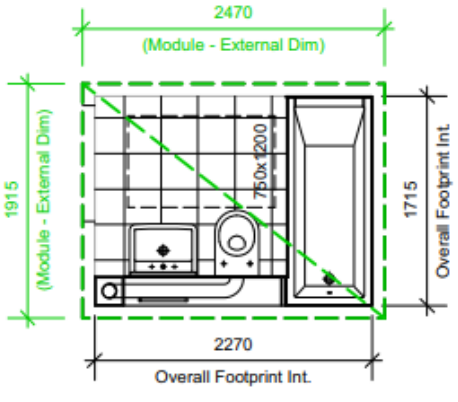
# Residential



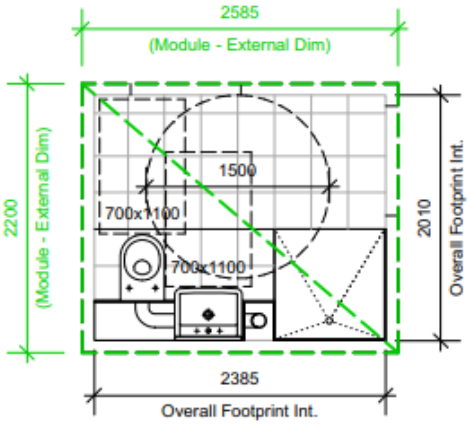

**WC POD TYPE 1**
Single-sided entry,
2150 x 1825mm,
washhand basin & toilet on
adjacent walls.



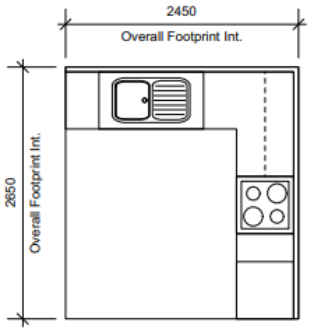

**WC POD TYPE 2**
Two-sided entry,
2150 x 1825mm,
All fittings to same wall.



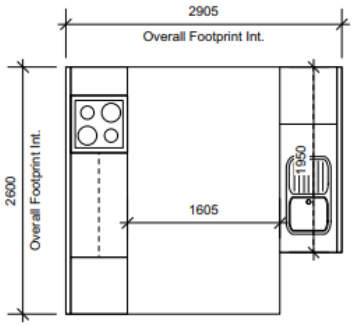

**WC POD TYPE 3**
Two-sided entry,
2270 x 1715mm Special,
All fittings to same wall,
SVP to corner.



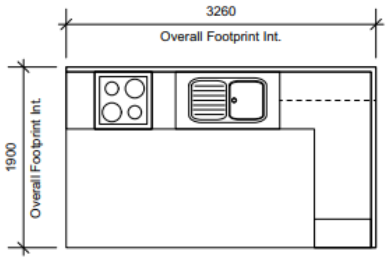

**WC POD TYPE 4 UD**
Two-sided entry,
2385 x 2010mm UD minimum sizing,
All fittings to same wall,
wet room with floor drain.



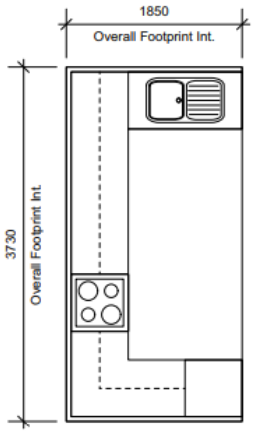

**KITCHEN TYPE 1**



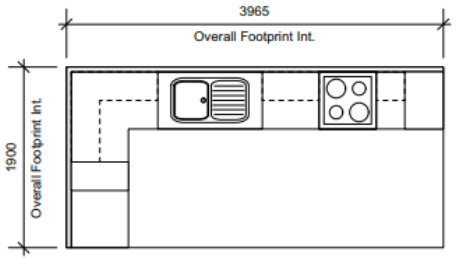

**KITCHEN TYPE 2**




**KITCHEN TYPE 3**




**KITCHEN TYPE 4**




**KITCHEN TYPE 5**

# living, working, learning, wellbeing

BUILDING COMMUNITIES

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